

What is claimed is:

- 1           1.       A method of managing multiple levels of fault protection in a data  
2       communication network, comprising:  
3               storing in the network fault protection criteria for each of a plurality of  
4       resources in the network, including a type of fault protection available to the  
5       resource;  
6               determining desired fault protection criteria for a communication path  
7       between a node of the network that is a source for data and a node of the network  
8       that is a destination for the data;  
9               selecting a candidate resource of the network for the communication path;  
10       and  
11               determining from the fault protection criteria for the candidate resource  
12       whether the candidate resource provides at least the desired level of fault  
13       protection and when the candidate resource provides at least the desired level of  
14       fault protection, selecting the candidate resource for the communication path.
- 1           2.       The method according to claim 1, wherein the communication path is a  
2       label switched path (LSP).
- 1           3.       The method according to claim 1, further comprising selecting another  
2       candidate resource when the candidate resource does not provide at least the  
3       desired level of fault protection.
- 1           4.       The method according to claim 1, further comprising modifying the  
2       network to provide another candidate resource that does provide at least the  
3       desired level of fault protection when the candidate resource does not provide at  
4       least the desired level of fault protection.
- 1           5.       The method according to claim 1, wherein the fault protection criteria for  
2       each of the plurality of resources includes indicia of a type of the resource.

1        6.        The method according to claim 5, wherein the type of the resource  
2 includes a multiple-hop path segment.

1        7.        The method according to claim 5, wherein the type of the resource  
2 includes a single network node.

1        8.        The method according to claim 5, wherein the type of the resource  
2 includes a single network link.

1        9.        The method according to claim 1, wherein the type of fault protection  
2 available to the resource includes 1:n protection.

1        10.       The method according to claim 9, wherein the type of fault protection  
2 available to the resource includes 1:1 protection.

1        11.       The method according to claim 10, wherein the type of fault protection  
2 available to the resource includes ring protection.

1        12.       The method according to claim 1, wherein the type of fault protection  
2 available to the resource includes a fast re-route technique.

1        13.       The method according to claim 1, wherein the type of fault protection  
2 available to the resource includes slot-level protection.

1        14.       The method according to claim 13, wherein when less than all of ports  
2 associated with a particular slot fails, a type of fault protection other than slot-  
3 level protection is available for recovery.

1        15.    The method according to claim 1, wherein the fault protection criteria for  
2        each of the plurality of resources includes indicia of a recovery time for the  
3        resource.

1        16.    The method according to claim 15, wherein said determining comprises  
2        comparing the indicia of the recovery time for the certain ones of the resources of  
3        the network to a maximum desired recovery time for the path between the source  
4        and the destination.

1        17.    The method according to claim 1, wherein the fault protection criteria for  
2        each of the plurality of resources includes indicia of characteristics of a back-up  
3        path for the resource.

1        18.    The method according to claim 17, wherein the characteristics of the back-  
2        up path include indicia of its quality.

1        19.    A method of managing multiple levels of fault protection in a data  
2        communication network, comprising:  
3                advertising within a network fault protection criteria for each of a plurality  
4        of resources of the network;  
5                determining desired fault protection criteria for a communication path  
6        between a node of the network that is a source for data and a node of the network  
7        that is a destination for the data;  
8                selecting a candidate resource in the network for the communication path;  
9        and  
10                determining from the advertised fault protection criteria for the candidate  
11        resource whether the candidate resource provides at least the desired level of fault  
12        protection and when the candidate resource provides at least the desired level of  
13        fault protection, selecting the candidate resource for the communication path.

1        20.    The method according to claim 19, the communication path being a label  
2        switched path.

1        21.    The method according to claim 19, further comprising a step of specifying  
2        the fault protection criteria prior to said advertising, said step of specifying being  
3        performed under control of a distributed network manager implemented by each  
4        of the plurality of nodes of the network.

1        22.    The method according to claim 20, said selecting being performed by the  
2        node that is the source for the data.

1        23.    The method according to claim 20, further comprising selecting another  
2        candidate resource when the candidate resource does not provide at least the  
3        desired level of fault protection.

1        24.    The method according to claim 20, further comprising modifying the  
2        network to provide another candidate resource that does provide at least the  
3        desired level of fault protection when the candidate resource does not provide at  
4        least the desired level of fault protection.

1        25.    The method according to claim 1, wherein the fault protection criteria for  
2        each of the plurality of resources includes a type of the resource.

1        26.    The method according to claim 25, wherein the type of one or more of the  
2        resources includes a multiple-hop path segment.

1        27.    The method according to claim 25, wherein the type of one or more of the  
2        resources includes a single network node.

1        28.    The method according to claim 25, wherein the type of one or more of the  
2        resources includes a single network link.

1        29.    The method according to claim 24, wherein the fault protection criteria for  
2        each of the plurality of resources includes a type of fault protection available to  
3        the resource.

1        30.    The method according to claim 29, wherein the type of fault protection  
2        available to one or more of the resources includes 1:n protection.

1        31.    The method according to claim 29, wherein the type of fault protection  
2        available to one or more of the resources includes 1:1 protection.

1        32.    The method according to claim 29, wherein the type of fault protection  
2        available to one or more of the resources includes ring protection.

1        33.    The method according to claim 29, wherein the type of fault protection  
2        available to one or more of the resources includes a fast re-route technique.

1        34.    The method according to claim 29, wherein the type of fault protection  
2        available to one or more of the resources includes slot-level protection.

1        35.    The method according to claim 34, wherein when less than all ports  
2        associated with a particular slot fails, a type of fault protection other than slot-  
3        level protection is available for recovery.

1        36.    The method according to claim 24, wherein the fault protection criteria for  
2        each of the plurality of resources includes indicia of a recovery time for the  
3        resource.

1        37.    The method according to claim 36, wherein said determining comprises  
2        comparing the indicia of the recovery time for the certain ones of the resources of

3 the network to a maximum desired recovery time for the path between the source  
4 and the destination.

1 38. The method according to claim 24, wherein the fault protection criteria for  
2 each of the plurality of resources includes indicia of characteristics of a back-up  
3 path for the resource.

1 39. The method according to claim 38, wherein the characteristics of the back-  
2 up path include indicia of its quality.

1 40. A system for managing multiple levels of fault protection in a data  
2 communication network, comprising:

3 a plurality of resources in a network, each having a specified fault  
4 protection criteria that includes indicia of a type of fault protection available to  
5 the resource; and

6 a plurality of candidate resources in the network for a communication path  
7 between a node of the network that is a source for data and a node of the network  
8 that is a destination for the data, wherein the source node determines from the  
9 fault protection criteria for the plurality of candidate resources whether the  
10 candidate resources provide at least the desired level of fault protection and, when  
11 a candidate resource provides at least the desired level of fault protection, the  
12 source node selects the candidate resource for the path.

1 41. The system according to claim 40, wherein the fault protection criteria is  
2 advertised to a plurality of nodes in the network.

1 42. The system according to claim 40, wherein the fault protection criteria for  
2 each of the plurality of resources includes indicia of a type of the resource.

1 43. The system according to claim 40, wherein the type of fault protection  
2 available to one or more of the resources includes slot-level protection.

1        44.    The system according to claim 43, wherein when less than all ports  
2        associated with a particular slot fails, a type of fault protection other than slot-  
3        level protection is available for recovery.

1        45.    The system according to claim 40, wherein the fault protection criteria for  
2        each of the plurality of resources includes indicia of a recovery time for the  
3        resource.

1        46.    The system according to claim 45, wherein the source node compares the  
2        indicia of the recovery time for the certain ones of the resources of the network to  
3        a maximum desired recovery time for the path between the source and the  
4        destination.

1        47.    The system according to claim 40, wherein the fault protection criteria for  
2        each of the plurality of resources includes indicia of characteristics of a back-up  
3        path for the resource.

1        48.    The system according to claim 47, wherein the characteristics of the back-  
2        up path include indicia of its quality.